

# innovative infrared temperature sensors



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**CALEX**  
ELECTRONICS LIMITED

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# PyroMini

## Miniature Infrared Temperature Sensor with Optional High-Ambient Sensing Head and Touch Screen



Model shown includes optional touch screen

- Miniature sensing head and configurable electronics module
- Touch screen (optional) for temperature indication and configuration. Screen changes colour in alarm condition for maximum visibility
- High-ambient sensing heads (optional) withstand up to 120°C or 180°C without cooling
- Adjustable emissivity setting on all models - suitable for a wide range of target materials such as paper, plastics, food, painted surfaces, and many more
- Data logging to MicroSD Card (optional) on touch screen models
- Resistant to interference from movement of sensing head cable - ideal for mounting on robot arms
- 4 to 20 mA or RS485 Modbus outputs
- Alarm relay outputs rated 24 V DC (optional) - no need for separate trip amplifier
- Temperature ranges from -20°C to 1000°C
- Maximum, minimum, average and instantaneous readings, peak or valley hold, reflected energy compensation
- Optional mounting brackets, air purge collar and laser sighting tool
- Sensing head sealed to IP65

### GENERAL SPECIFICATIONS

#### Temperature Range

See table of Model Numbers

#### Maximum Temperature Span (-CRT models)

1020°C

#### Minimum Temperature Span (-CRT models)

100°C

#### Output

4 to 20 mA or RS485 Modbus\*

#### Field of View

See table of Model Numbers

#### Accuracy

± 1°C or 1%, whichever is greater

#### Repeatability

± 0.5°C or 0.5%, whichever is greater

#### Emissivity Setting Range

0.20 to 1.00

#### Emissivity Setting Method

-CB models: via two rotary switches in electronics box

-BB and -BRT models: via RS485

-CRT and -BRT models: via touch screen

#### Response Time, $t_{90}$

240 ms (90% response)

#### Spectral Range

8 to 14  $\mu$ m

#### Supply Voltage

24 V DC  $\pm$  5%

#### Maximum Current Draw

100 mA

#### Maximum Loop Impedance

CB and -CRT models: 900  $\Omega$  (4 to 20 mA output)

#### Alarm Relays (-CRT and -BRT models)

2 x Single Pole Changeover alarm relays rated

24 V DC, 1 A, isolated 500 V DC

\* Up to 247 sensors may be installed on a single Modbus network.

### MECHANICAL

	Sensing head	Electronics Module
<b>Construction</b>	Stainless Steel 316	Die-cast Aluminium
<b>Major Dimensions</b>	Ø18 x 45 mm (see diagram)	98(w) x 64(h) x 36(d) mm (see diagram)
<b>Mounting</b>	M16 x 1 mm thread	Two M4 screws for wall mounting (see diagram)

#### Cable Length (sensing head to electronics module)

1 m (standard), up to 30 m (optional)

#### Weight with 1 m Cable

390 g (approx)

#### Cable Connections

Removable screw terminal blocks (see Connections)

Conductor size: 28 AWG to 18 AWG

Suitable for cable diameters 3.0 to 6.5 mm

#### Output Cable Gland

### ENVIRONMENTAL

	Sensing head	Electronics Module (without touch screen)	Electronics Module (with touch screen)
<b>Environmental Rating</b>	IP65 (NEMA 4)	IP65 (NEMA 4)	-
<b>Ambient Temperature Range</b>	See table of Model Nos	0°C to 60°C	0°C to 60°C
<b>Relative Humidity</b>	Maximum 95% non-condensing	Maximum 95% non-condensing	Maximum 95% non-condensing
<b>CE Marked</b>	Yes	Yes	Yes
<b>RoHS Compliant</b>	Yes	Yes	Yes

### ELECTROMAGNETIC COMPATIBILITY STANDARDS:

Class	Standard	Description
<b>EMC Directive</b>	EN61326-1:2006	Electrical equipment for measurement, control and laboratory use – Industrial
<b>- Immunity</b>	IEC 61000-4-2	Electrostatic Discharge Immunity
	IEC 61000-4-3	Electromagnetic Field Immunity
	IEC 61000-4-4	Burst Immunity
	IEC 61000-4-5	Surge Immunity
	IEC 61000-4-6	Conducted RF Immunity
<b>- Emissions</b>	EN 55022A	RF Emissions Class A
	EN 55022B	RF Emissions Class B

## TOUCH SCREEN (-CRT AND -BRT MODELS)

The optional backlit touch screen interface mounted in the lid of the electronics module provides a large, bright display of the measured temperature, as well as controls allowing full configuration of the sensor. The graph view shows the history of the measured temperature.

In alarm conditions, the display changes colour to provide an immediate and obvious alarm indication. Alarm modes and levels can be configured via the touch screen.

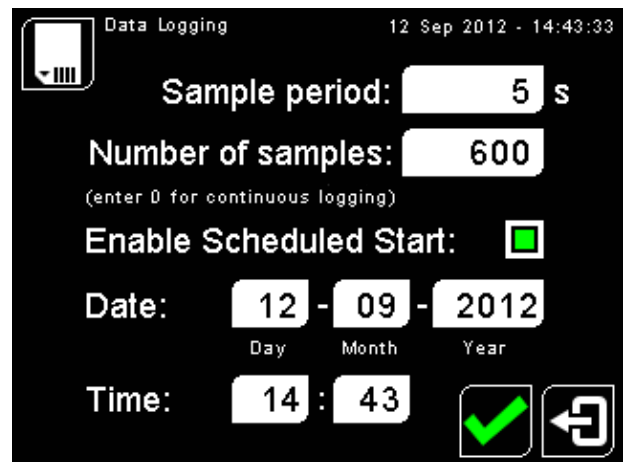
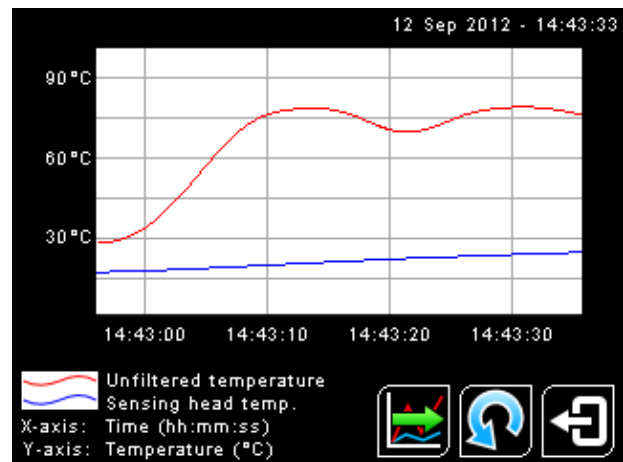
## TOUCH SCREEN SPECIFICATIONS

<b>Touch Screen Display Format</b>	2.83" (72 mm) resistive touch TFT, 320 x 240 pixels, backlit
<b>Configurable Parameters</b>	Temperature range, temperature units, emissivity setting, reflected energy compensation, alarms, signal processing, Modbus address (-BRT models), date and time, data logging
<b>Temperature Units</b>	°C or °F configurable
<b>Temperature Resolution</b>	0.1°
<b>Alarm Configuration</b>	Two alarms with adjustable level, individually configurable as HI or LO. Alarm 2 can be set to target temperature or sensing head internal temperature
<b>Signal Processing</b>	Average, peak hold, valley hold, minimum, maximum

## EXAMPLE SCREENSHOTS



Screen shown with red background to indicate alarm condition



## DATA LOGGING SPECIFICATIONS

<b>Data Logging Interval</b>	1 to 86,400 seconds (1 day)
<b>MicroSD Card</b>	Max. capacity: 2 GB (not included)
<b>Internal Clock Battery</b>	1 x BR 1225 3V (not included)
<b>Variables Logged</b>	Target temperature, sensing head temperature, electronics module temperature, max, min, average, emissivity setting, reflected energy compensation temperature, alarm events
<b>File format</b>	.csv
<b>Configurable Parameters</b>	Sample period, number of samples, scheduled start date and time

## DATA LOGGING (-CRT AND -BRT MODELS)

The PyroMini can be used as a standalone data logger.

PyroMini models -CRT and -BRT include a MicroSD card slot for data logging, which can be configured via the touch screen interface. The user can select the sample rate and the number of samples to be taken and schedule the data logging to start at a certain time.

With a 2 GB card, the user can store 28.4 million readings, which provides almost 1 year's worth of data at the fastest possible sample rate of 1 per second.

Data is stored on the MicroSD card in .csv format and can be viewed and edited easily using spreadsheet software. Alarm events can also be logged to the MicroSD Card.

A MicroSD card with SD card adapter is available as an optional accessory.

The MicroSD card slot and battery holder are located on the touch screen circuit board in the lid of the PyroMini. Readings are time and date stamped using the sensor's internal clock. The clock is reset when the power is disconnected, or it will continue if the optional battery is fitted.

MODEL NUMBERS

Series	Sensing Head Operating Temperature Range	Field of View	Measurement Temperature Range	Output and Interface
PM	MA	21 151 301 CF	LT MT HT XT	CB
			CT	CRT BB BRT
	HA JA	201	HT XT	CB
			CT	CRT BB BRT



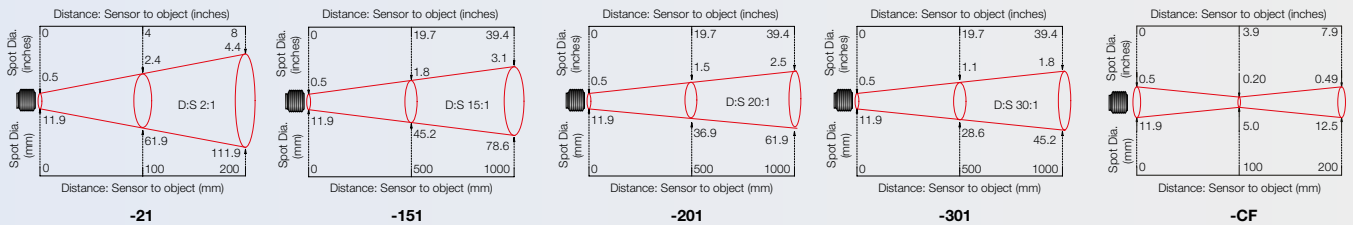
SENSING HEAD OPERATING TEMPERATURE RANGE

- MA 0°C to 60°C
- JA 0°C to 120°C
- HA 0°C to 180°C

The sensing head on -JA and -HA models is able to withstand ambient temperatures of up to 120°C (-JA) and 180°C (-HA) without cooling. Both models are available with 20:1 optics.

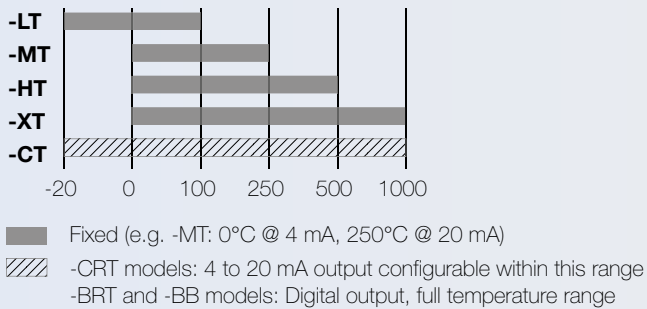
There is no need to supply cooling air or water, and the miniature sensing head is much smaller than bulky, cooled sensors.

FIELD OF VIEW



Diameter of target spot measured versus distance from sensing head - 90% energy

MEASUREMENT TEMPERATURE RANGE (°C)



OUTPUT AND INTERFACE

- CB 4 to 20 mA output, no screen
- CRT 4 to 20 mA output and two alarm relay outputs, with touch screen
- BB RS485 Modbus output, no screen
- BRT RS485 Modbus output and two alarm relay outputs, with touch screen

EXAMPLE: PM-MA-301-CT-BRT

Series	Sensing Head Operating Temperature	Optics	Temperature Range	Output and Interface
PM PyroMini	-MA 0°C to 60°C	-301 30:1 divergent	-CT Digital output, -20 to 1000 °C	-BRT RS485 Modbus output and two alarm relay outputs, with touch screen

## CONNECTIONS

### -CB and -CRT models

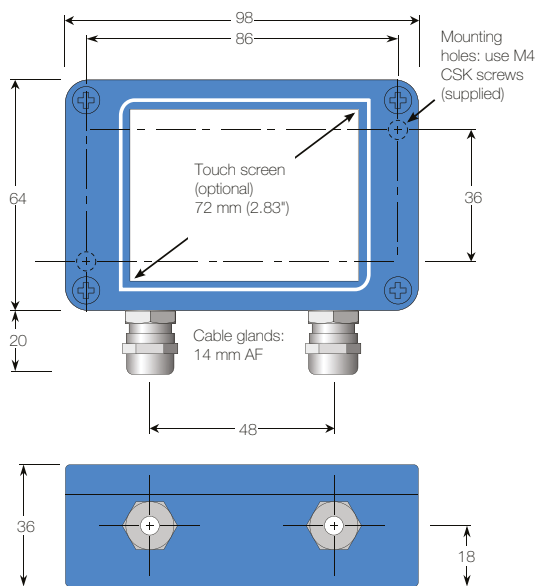


### -BB and -BRT models

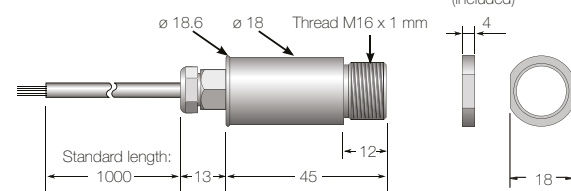


## DIMENSIONS AND ACCESSORIES

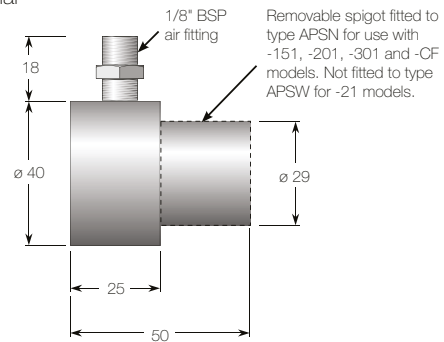
### Electronics Module



### Sensing Head



### Air Purge Collar



All dimensions in mm

## ACCESSORIES ALSO AVAILABLE

MicroSD Card with SD Card adapter: stores logged data (-CRT and -BRT models) **MSD**

Extended cable between sensing head and electronics module (-MA models) **PMCE**

(-HA models) **PMCEHT**

Calibration certificate **CALCERTA**

Laser sighting tool **LSTS**

Adjustable mounting bracket **ABS**

Fixed mounting bracket **FBS**

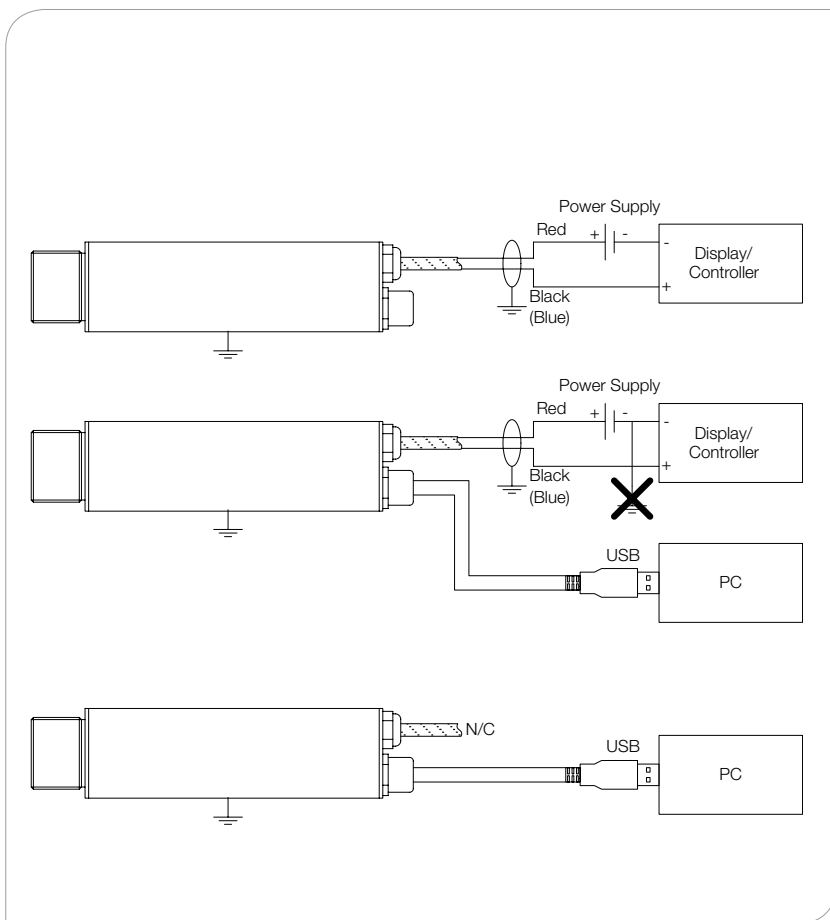
6-channel Modbus temperature indicator with data logging **PM180**



# PyroUSB PC Configurable Non-Contact Temperature Sensor with 4 to 20 mA Output



- Configurable temperature range, emissivity setting etc. from a PC via CalexSoft software and USB cable (supplied)
- Features max; min; average and instantaneous readings; peak or valley hold; reflected energy compensation
- OPC Server capabilities
- Temperature range  $-40$  to  $1000^{\circ}\text{C}$
- Emissivity: 0.1 to 1.0
- Response time: 240 ms to 90%
- Stainless steel housing, sealed to IP65
- Field of view: 15:1, 30:1 or Close Focus
- 4 to 20 mA output
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets



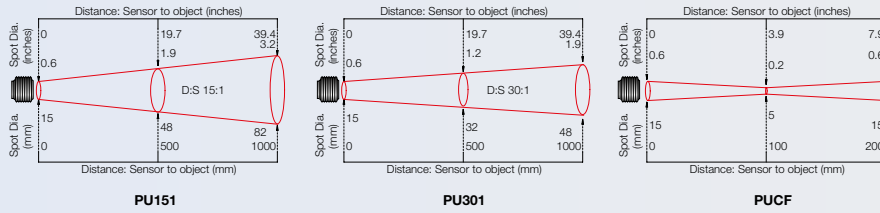
The PyroUSB Series measures temperatures from  $-40^{\circ}\text{C}$  to  $1000^{\circ}\text{C}$  accurately and consistently, with an outstanding response time of 240 ms. The 4 to 20 mA output is compatible with almost any indicator, controller, recorder, data logger etc. without the need for special interfacing or signal conditioning.

Model PU151 has 15:1 optics making it suitable for most applications. PU301 is specially designed for distant targets and has an optical resolution of 30:1. PUCF is designed for small targets and measures a spot size of  $\varnothing 5\text{mm}$  at 100mm distance.

All PyroUSB Series sensors are fully configurable from a PC using the CalexSoft software and USB cable supplied. This user friendly software enables the user to set the range and emissivity, compensate for reflected energy; apply filtering; select max, min, average or instantaneous readings; and peak or valley hold processing. These features can also be monitored and adjusted by an OPC Client. Other features include Data Acquisition, Alarms and a Scrolling Graphical Display.

The sensor will operate with either the 4 to 20 mA cable connected, the USB cable connected, or both. The USB cable has an IP65 connector at the sensor end. An IP65 cap protects the sensor when the USB cable is not connected.

## DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



## ACCESSORIES

### FIXED MOUNTING BRACKET



The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.

### ADJUSTABLE MOUNTING BRACKETS



The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.

### AIR PURGE COLLAR



The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.

### AIR/WATER COOLED HOUSING



The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling

required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.

### LASER SIGHTING TOOL



The Laser Sighting Tool screws onto the front of the sensor and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre

of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

## GENERAL SPECIFICATIONS

### Temperature Range

-40°C to 1000°C

### Field-of-View

15:1 (PU151)

30:1 (PU301)

ø5mm @ 100mm (PUCF)

### Output

4 to 20 mA (linear with temperature)

### Configuration

Via PC port conforming to USB 2.0

### Accuracy

±1% of reading or ±1°C whichever is greater

### Repeatability

±0.5% of reading or ±0.5°C whichever is greater

### Emissivity

0.1 to 1.0

### Response Time, $t_{90}$

240 ms (90% response)

### Spectral Range

8 to 14  $\mu\text{m}$

### Supply Voltage

24 V DC (28Vdc max)

### Sensor Voltage

6 V DC min

### Max Loop Impedance

900  $\Omega$

### Maximum Span

1000°C

### Minimum Span

100°C

## MECHANICAL

### Construction

Stainless Steel

### Dimensions

25 mm diameter x 106.5 mm long

### Thread mounting

M20 x 1 mm pitch

### Weight with Output Cable

175 g

### Output Cable Length

1 m

### USB Cable Length

1 m

## ENVIRONMENTAL

### Environmental Rating

IP65

### Ambient Temperature Range

0°C to 70°C

### Relative Humidity

95% max. non-condensing

## MODEL NUMBERS

PUxxx xx

### Cooling

(blank) = Sensor without cooling

WJ = Air/water cooled jacket with air purge collar

### Field of view

151 = 15:1 divergent optics

301 = 30:1 divergent optics

CF = Close-focus optics (focal spot size 5 mm at 100 mm distance)



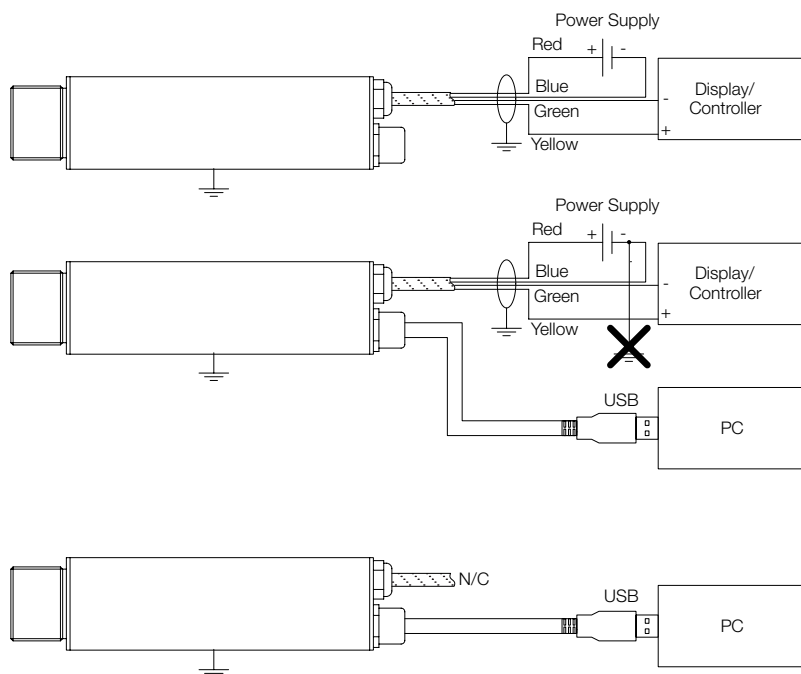
# PyroUSB 2.2

## PC Configurable Infrared Temperature Sensor for Demanding Applications



- Short-wavelength measurement for low-emissivity targets such as steel rollers and other metal surfaces, even at low temperatures
- Configurable temperature range, emissivity setting etc. from a PC via CalexSoft software and USB cable (supplied)
- Features max, min, average and instantaneous readings; peak or valley hold; reflected energy compensation
- OPC Server capabilities
- Temperature ranges from 45°C to 2000°C
- Emissivity: 0.1 to 1.0
- Stainless steel housing, sealed to IP65
- Field of view: 15:1, 25:1, 75:1 or Close Focus
- Selectable 0 to 20 mA or 4 to 20 mA output
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets

### SENSOR CONNECTION



**Note:** The sensor must be grounded at only one point, either the cable shield or the sensor housing.

The PyroUSB 2.2 Series of infrared pyrometers measures temperatures from 45°C to 2000°C accurately and consistently, with an outstanding response time.

The selectable 0 to 20 mA or 4 to 20 mA output is compatible with almost any indicator, controller, recorder, data logger etc. without the need for special interfacing or signal conditioning.

Models with temperature range 45°C to 300°C, or 100°C to 400°C have 15:1 optics.

For models with temperature range 250°C to 1000°C, or 450°C to 2000°C, a choice of optics is available:

PU251-2.2 models have 25:1 optics and are suitable for most target sizes and distances.

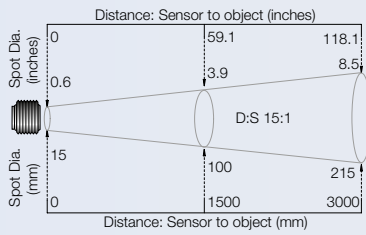
PU751-2.2 models are specially designed for distant targets and have an optical resolution of 75:1.

PUCF-2.2 models are designed for small targets and measure a spot size of  $\varnothing$  7.5 mm at 500 mm distance.

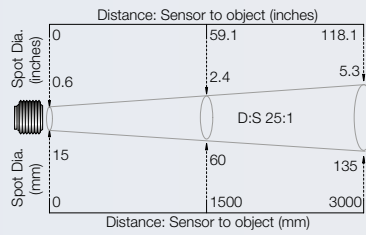
All PyroUSB 2.2 Series sensors are fully configurable from a PC using the CalexSoft software and USB cable supplied. This user-friendly software enables the user to set the temperature range and emissivity setting, compensate for reflected energy; apply filtering; select max, min, average or instantaneous readings; and configure peak or valley hold processing. These features can also be monitored and adjusted by an OPC Client. Other features include data acquisition, alarms and a scrolling graphical display.

The sensor will operate with either the 4 to 20 mA cable connected, the USB cable connected, or both. The USB cable has an IP65 connector at the sensor end. An IP65 cap protects the sensor when the USB cable is not connected.

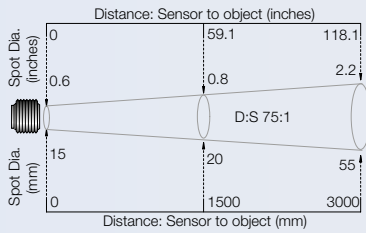
## DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD (90% ENERGY)



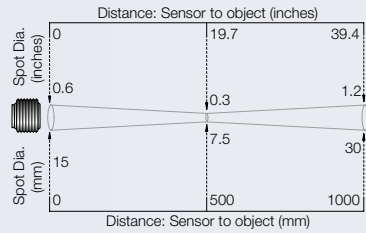
PU151-2.2



PU251 - 2.2



PU751-2.2



PUCF-2.2

## GENERAL SPECIFICATIONS

<b>Temperature Range</b>	LT: 45°C* to 300°C (PU151LT2.2 only) PT: 100°C to 400°C (PU151PT2.2 only) MT: 250°C to 1000°C HT: 450°C to 2000°C
<b>Field-of-View</b>	15:1 (PU151LT or PT) 25:1 (PU251MT or HT) 75:1 (PU751MT or HT) ø7.5mm @ 500mm (PUCFMT or HT)
<b>Output</b>	Selectable 4 to 20 mA or 0 to 20 mA (linear with temperature)
<b>Configuration</b>	Via PC port conforming to USB 2.0
<b>Accuracy *</b>	±1% of reading or ±2°C, whichever is greater
<b>Repeatability *</b>	±0.5% of reading or ±0.5°C, whichever is greater
<b>Emissivity Setting</b>	0.1 to 1.0
<b>Response Time, t<sub>90</sub></b>	≥240 ms (90% response)
<b>Spectral Range</b>	2.0 to 2.4 μm
<b>Supply Voltage</b>	24 V DC (26 V DC max)
<b>Sensor Voltage</b>	11 V DC min
<b>Max Loop Impedance</b>	900 Ω @ 24 V DC
<b>Maximum Span</b>	Full temperature range (up to 1550°C)
<b>Minimum Span</b>	100°C

\* Object temperature > T<sub>min</sub> (see graph of Minimum Measurable Temperature)

## MECHANICAL

<b>Construction</b>	Stainless Steel
<b>Dimensions</b>	25 mm diameter x 106.5 mm long
<b>Thread mounting</b>	M20 x 1 mm pitch
<b>Weight with Output Cable</b>	175 g
<b>Output Cable Length</b>	1 m (longer cable available to order)
<b>USB Cable Length</b>	1 m

## ENVIRONMENTAL

<b>Environmental Rating</b>	IP65
<b>Ambient Temperature</b>	0°C to 70°C
<b>Relative Humidity</b>	95% max. non-condensing

## ACCESSORIES



**FIXED AND ADJUSTABLE MOUNTING BRACKETS**



**AIR PURGE COLLAR**  
The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens.



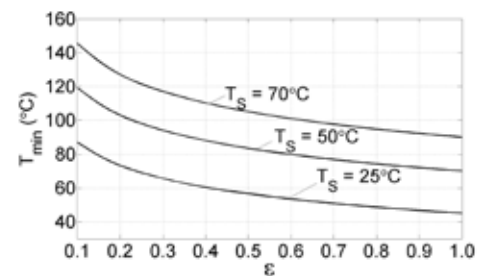
**AIR/WATER COOLED HOUSING**  
The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other.

To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.



**LASER SIGHTING TOOL**  
The Laser Sighting Tool screws onto the front of the sensor during installation and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

## MINIMUM MEASURABLE TEMPERATURE (PU151LT2.2 only)



Graph showing the minimum measurable object temperature (T<sub>min</sub>), determined by surface emissivity (ε) and sensor temperature (T<sub>s</sub>).

## MODEL NUMBERS

**PUxxx xx 2.2 xx**

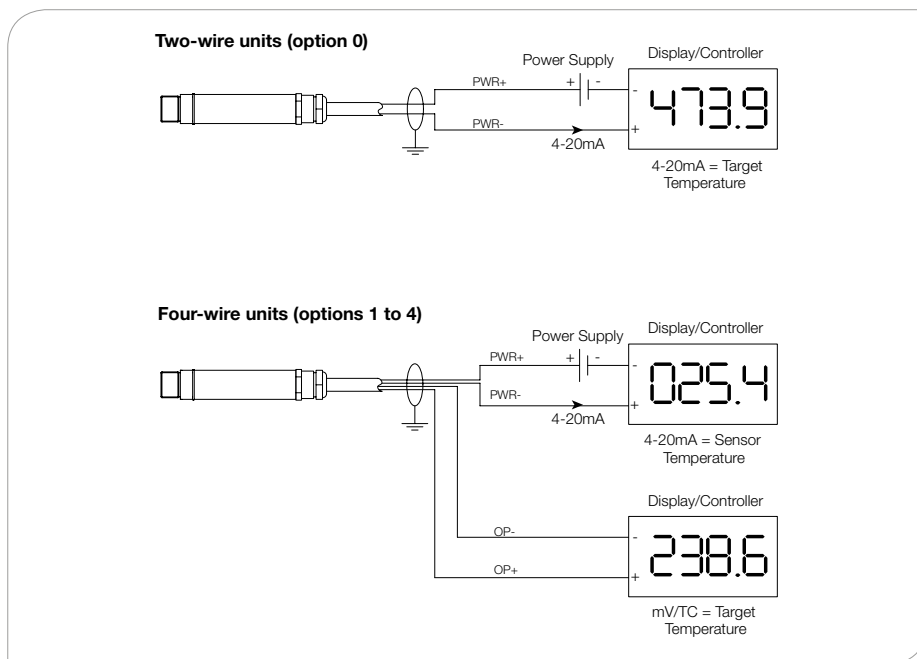
<b>Cooling</b>	(blank) = Uncooled sensor WJ = Air/water cooled jacket with air purge collar
<b>Temperature range</b>	LT = 45 to 300 °C (model PU151LT2.2 only) PT = 100 to 400 °C (model PU151PT2.2 only) MT = 250 to 1000 °C HT = 450 to 2000 °C
<b>Field of view</b>	151 = 15:1 divergent optics (model PU151LT or PT) 251 = 25:1 divergent optics (model PU251MT or HT) 751 = 75:1 divergent optics (model PU751MT or HT) CF = Close-focus optics (focal spot size 7.5 mm at 500 mm distance) (model PUCFMT or HT)

# PyroCouple

## Compact Non-Contact Temperature Sensor with optional Dual Output



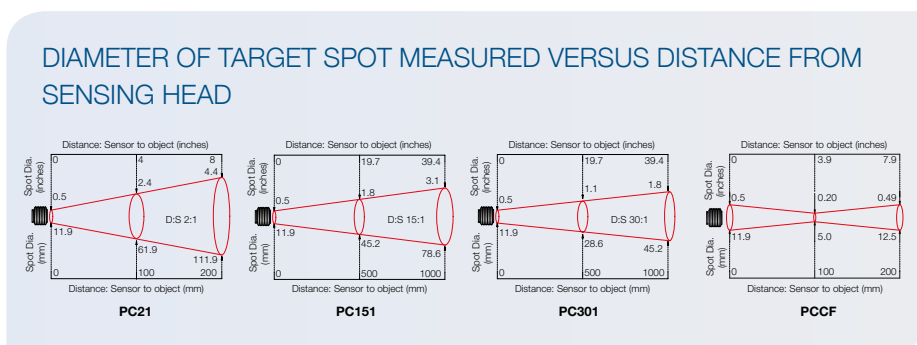
- Temperature range: -20°C to 500°C
- Emissivity setting: fixed at 0.95
- Two-wire 4-20 mA output or four-wire voltage/thermocouple output
- Four-wire unit also provides internal sensor temperature
- Field of view: 2:1, 15:1, 30:1 or close focus
- Fast response with high stability
- Stainless steel housing, sealed to IP65
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets



The PyroCouple Series is a range of high quality, low cost, compact sensors which measure the temperature of inaccessible or moving objects and materials. They measure temperatures from -20°C to 500°C, accurately and consistently, with an outstanding response time of 240 ms.

Two-wire PyroCouple sensors transmit the target temperature as a 4-20 mA output and offer a simple solution for most non-contact temperature measurement applications.

Four-wire PyroCouple sensors transmit the target temperature as a 0-50 mV or thermocouple output (type J, K or T) plus the internal sensor temperature as a 4-20 mA output. This second output can be used to ensure that the sensor is being operated within the correct ambient temperature limits and prevent damage caused by overheating or overcooling. It can also be used to give an approximate indication of the air temperature surrounding the sensor.



All PyroCouple sensors are fitted with precision Germanium lenses for accurate optics. Model PC21 has 2:1 optics making it suitable for most applications where the sensor can be mounted close to the target. Model PC151 is designed for small or distant targets and has an optical resolution of 15:1. Model PC301 is designed for very small or distant targets and has an optical resolution of 30:1. Model PCCF is designed for targets as small as  $\varnothing 5\text{mm}$  at a distance of 100mm from the sensor.

## GENERAL SPECIFICATIONS

### Temperature Range vs Field-of-View table

Field of View	-20°C to 100°C	0°C to 250°C	0°C to 500°C
2:1	PC21LT-x	PC21MT-x	-
15:1	PC151LT-x	PC151MT-x	PC151HT-x
30:1	PC301LT-x	PC301MT-x	PC301HT-x
ø5mm @ 100mm	PCCFLT-x	PCCFMT-x	PCCFHT-x

Note: -x denotes the output type, see table below

### Output table

Model-X	Target Temperature Output	Sensor Temperature Output
-0	4-20 mA	Not available
-1	0-50 mV	4-20 mA
-2	Type T thermocouple	4-20 mA
-3	Type J thermocouple	4-20 mA
-4	Type K thermocouple	4-20 mA

e.g. Model PC151HT-4 has a 15:1 field of view and provides a type K thermocouple output representing target temperatures of 0°C to 500°C plus a 4-20 mA output proportional to internal sensor temperature. **For simplicity, the sensor temperature range is always set the same as the target temperature range**

<b>Accuracy</b>	±1% of reading or ±1°C whichever is greater
<b>Repeatability</b>	± 0.5% of reading or ± 0.5°C whichever is greater
<b>Emissivity</b>	Fixed at 0.95
<b>Response Time, <math>t_{90}</math></b>	240 ms (90% response)
<b>Spectral Range</b>	8 to 14 $\mu$ m
<b>Supply Voltage</b>	24 V DC (28 V DC max.)
<b>Min. Sensor Voltage</b>	6 V DC
<b>Max. Loop Impedance</b>	900 $\Omega$ (4-20 mA output)
<b>Output Impedance</b>	56 $\Omega$ (voltage/thermocouple output)

## MECHANICAL

<b>Construction</b>	Stainless Steel
<b>Dimensions</b>	18 mm diameter x 103 mm long
<b>Thread Mounting</b>	M16 x 1 mm pitch
<b>Cable Length</b>	1m (longer lengths available to order)
<b>Weight with Cable</b>	95 g

## ENVIRONMENTAL

<b>Environmental Rating</b>	IP65
<b>Ambient Temperature Range</b>	0°C to 70°C
<b>Relative Humidity</b>	95% max. non-condensing

## ACCESSORIES

### FIXED MOUNTING BRACKET



The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.

### ADJUSTABLE MOUNTING BRACKETS



The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.

### AIR PURGE COLLAR



The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.

### AIR/WATER COOLED HOUSING



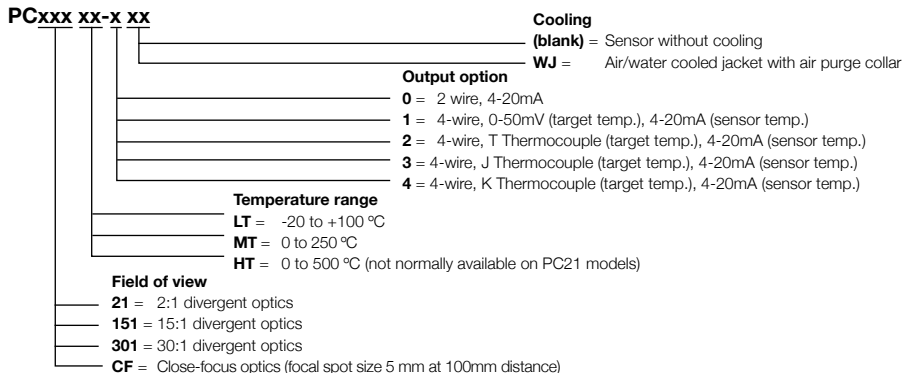
The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.

### LASER SIGHTING TOOL



The Laser Sighting Tool screws onto the front of the sensor and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

## MODEL NUMBERS

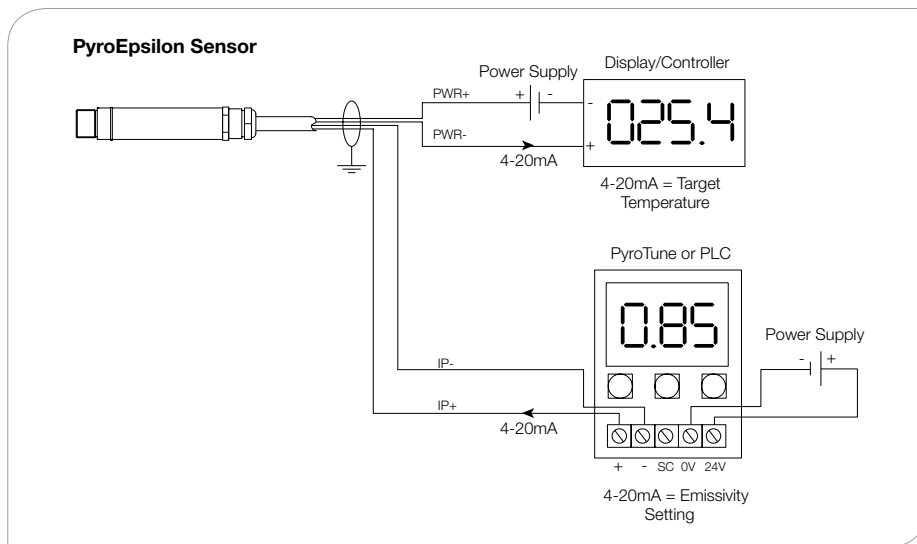


# PyroEpsilon

## Compact Non-Contact Temperature Sensor with Controllable Emissivity Setting



- Temperature range: -20°C to 500°C
- Two-wire 4-20 mA output proportional to target temperature
- 4-20mA input to control emissivity setting
- Optional PyroTune manual emissivity adjuster
- Field of view: 2:1, 15:1, 30:1 or close focus
- Fast response with high stability
- Stainless steel housing, sealed to IP65
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets

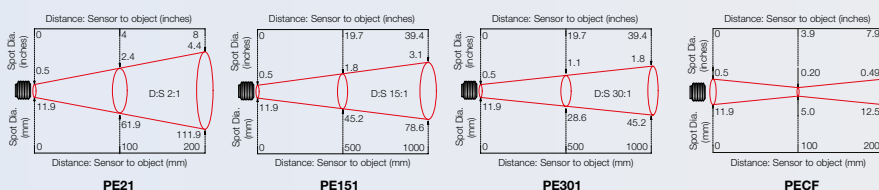


The PyroEpsilon Series is a range of high quality, low cost, compact sensors which measure the temperature of inaccessible or moving objects and materials. They measure temperatures from -20°C to 500°C, accurately and consistently, with an outstanding response time of 240 ms.

PyroEpsilon sensors transmit the target temperature as a 4-20 mA output.

The sensor's emissivity setting can be adjusted from 0.2 to 1.0 to cope with different target materials and is controlled by a 4-20 mA input. This gives the opportunity to adjust the emissivity setting automatically from a programmable logic controller (PLC). Alternatively the emissivity setting can be adjusted manually using the optional PyroTune module. If the 4-20 mA input is left open or short-circuit the emissivity setting defaults to 0.95.

### DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



All PyroEpsilon sensors are fitted with precision Germanium lenses for accurate optics. Model PE21 has 2:1 optics making it suitable for most applications where the sensor can be mounted close to the target. Model PE151 is designed for small or distant targets and has an optical resolution of 15:1. Model PE301 is designed for very small or distant targets and has an optical resolution of 30:1. Model PECF is designed for targets as small as  $\varnothing 5$  mm at a distance of 100 mm from the sensor

## PYROEPSILON SPECIFICATIONS

### Temperature Range vs Field-of-View table

Field of View	-20°C to 100°C	0°C to 250°C	0°C to 500°C
2:1	PE21LT	PE21MT	-
15:1	PE151LT	PE151MT	PE151HT
30:1	PE301LT	PE301MT	PE301HT
ø5mm @ 100mm	PECFLT	PECFMT	PECFHT

<b>Output</b>	4-20mA
<b>Accuracy</b>	±1% of reading or ±1°C whichever is greater
<b>Repeatability</b>	± 0.5% of reading or ± 0.5°C whichever is greater
<b>Emissivity</b>	0.2 to 1.0 via 4-20mA input
<b>Response Time, <math>t_{90}</math></b>	240 ms (90% response)
<b>Spectral Range</b>	8 to 14 $\mu\text{m}$
<b>Supply Voltage</b>	24 V DC (28 V DC max.)
<b>Min. Sensor Voltage</b>	6 V DC
<b>Max. Loop Impedance</b>	900 $\Omega$ ( 4-20 mA output)
<b>Input Impedance</b>	50 $\Omega$

### MECHANICAL

<b>Construction</b>	Stainless Steel
<b>Dimensions</b>	18 mm diameter x 103 mm long
<b>Thread Mounting</b>	M16 x 1 mm pitch
<b>Cable Length</b>	1m (longer lengths available to order)
<b>Weight with Cable</b>	95 g

### ENVIRONMENTAL

<b>Environmental Rating</b>	IP65
<b>Ambient Temperature Range</b>	0°C to 70°C
<b>Relative Humidity</b>	95% max. non-condensing

## PYROTUNE SPECIFICATIONS

<b>Output</b>	4-20mA
<b>Supply Voltage</b>	24 V DC (13 V to 28 V DC)
<b>Display Format</b>	3.5 digit LCD
<b>Display Units</b>	Emissivity (0.2 to 1.0) or current (4 - 20 mA)
<b>Adjustment</b>	Push-buttons (raise/lower/set)

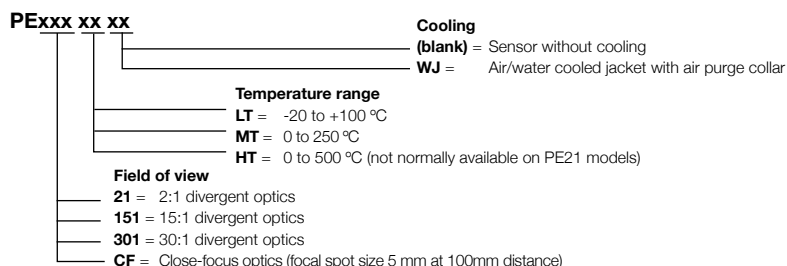
### MECHANICAL

<b>Construction</b>	Polycarbonate with gasket, transparent lid (PC) and quick release screws
<b>Mounting</b>	Surface
<b>Dimensions</b>	65 mm tall x 50 mm wide x 35 mm deep
<b>Weight</b>	72 g

### ENVIRONMENTAL

<b>Environmental Rating</b>	IP65
<b>Ambient Temperature Range</b>	0°C to 70°C
<b>Relative Humidity</b>	95% max. non-condensing

## MODEL NUMBERS



## ACCESSORIES



### FIXED MOUNTING BRACKET

The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.



### ADJUSTABLE MOUNTING BRACKET

The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.



### AIR PURGE COLLAR

The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.



### AIR/WATER COOLED HOUSING

The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.



### LASER SIGHTING TOOL

The Laser Sighting Tool screws onto the front of the sensor during installation and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

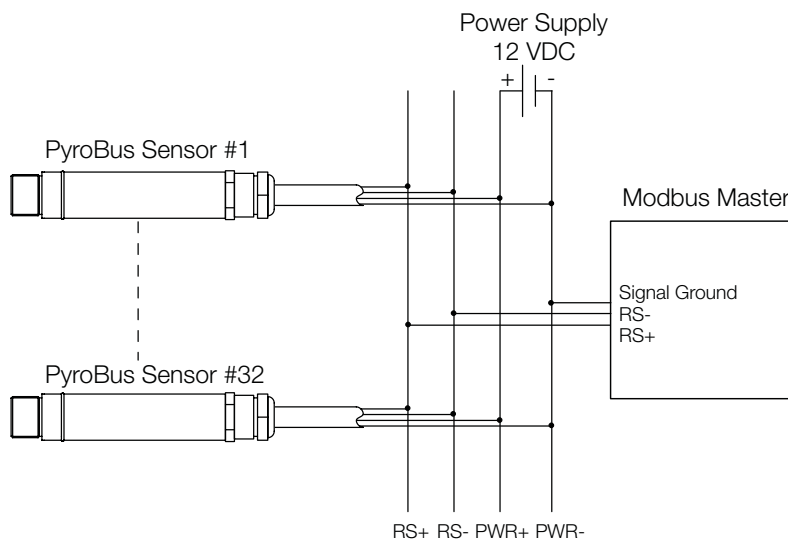
# PyroBus

## Non-Contact Temperature Sensor with RS485 Modbus Interface



- Wide temperature range from -20°C to 500°C
- Built-in RS485 Modbus RTU Interface
- Configurable emissivity setting and signal processing
- Max; min; average and instantaneous readings; peak or valley hold; reflected energy compensation
- 2:1, 15:1, 30:1 or close focus optics
- Fast response with high stability
- Stainless steel housing, sealed to IP65
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets
- Optional touch screen terminals for configuration, indication, alarm generation, and data logging from multiple sensors

### PYROBUS WITH MODBUS MASTER



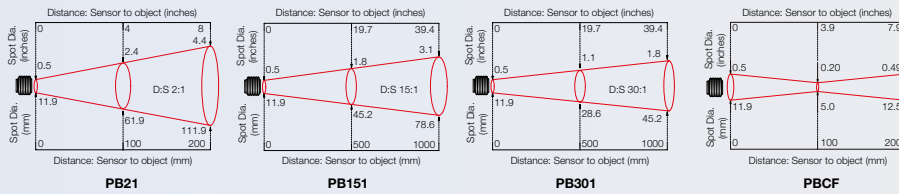
The PyroBus Series is a range of high quality, low cost, compact sensors which measure the temperature of inaccessible or moving objects and materials. They measure temperatures from -20°C to 500°C, accurately and consistently, with an outstanding response time of 240 ms.

Two-way digital communications via a built-in RS485 Modbus RTU interface enables the user to adjust the emissivity setting; compensate for reflected energy; apply filtering; select maximum, minimum, average or instantaneous readings; and peak or valley hold processing. Up to thirty two sensors can be installed on a single multidrop network.

All PyroBus sensors are fitted with precision Germanium lenses for accurate optics. Model PB21 has 2:1 optics making it suitable for most applications where the sensor can be mounted close to the target. Model PB151 is designed for small or distant targets and has an optical resolution of 15:1. Model PB301 is designed for very small or distant targets and has an optical resolution of 30:1. Model PBCF is designed for targets as small as  $\varnothing 5\text{mm}$  at a distance of 100mm from the sensor.

These compact sensors are small enough to fit almost anywhere and their rugged stainless steel housings make them ideal for applications where cleanliness and hygiene are paramount.

## DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



## ACCESSORIES

### FIXED MOUNTING BRACKET



The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.

### ADJUSTABLE MOUNTING BRACKETS



The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.

### AIR PURGE COLLAR



The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.

### AIR/WATER COOLED HOUSING



The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.

### LASER SIGHTING TOOL



The Laser Sighting Tool screws onto the front of the sensor and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

## GENERAL SPECIFICATIONS

<b>Temperature Range</b>	-20°C to 500°C
<b>Interface</b>	RS485 Modbus RTU
<b>Accuracy</b>	±1% of reading or ±1°C whichever is greater
<b>Repeatability</b>	± 0.5% of reading or ± 0.5°C whichever is greater
<b>Emissivity</b>	0.2 to 1.0
<b>Response Time, t<sub>90</sub></b>	240 ms (90% response)
<b>Spectral Range</b>	8 to 14 μm
<b>Supply Voltage</b>	12 V DC nominal (6 - 13 V DC)
<b>Supply Current</b>	50 mA max.
<b>Baud Rate</b>	9600 baud *
<b>Format</b>	8 data bits, no parity, 1 stop bit *

## MECHANICAL

<b>Construction</b>	Stainless Steel
<b>Dimensions</b>	18 mm diameter x 103 mm long
<b>Thread Mounting</b>	M16 x 1 mm pitch
<b>Cable Length</b>	1m (longer lengths available to order)
<b>Weight with Cable</b>	95 g

## ENVIRONMENTAL

<b>Environmental Rating</b>	IP65
<b>Ambient Temperature</b>	0°C to 70°C
<b>Relative Humidity</b>	95% max. non-condensing

\* Other configurations available upon request

## MODEL NUMBERS

PBxxx xx

### Cooling

(blank) = Sensor without cooling  
WJ = Air/water cooled jacket with air purge collar

### Field of view

21 = 2:1 divergent optics  
151 = 15:1 divergent optics  
301 = 30:1 divergent optics  
CF = Close-focus optics (focal spot size 5 mm at 100 mm distance)



# PM180 Series

## 6-channel Modbus Pyrometer Hub with Data Logging



- Compatible with PyroBus and PyroMini infrared temperature sensors with RS485 Modbus interface
- Operates as Modbus master and isolated Modbus slave
- Configure, display and log data and alarms from up to 6 sensors per PM180 unit, simultaneously or individually
- MicroSD Card stores up to 1 year of data (with 2 GB card)
- Touch screen with backlight
- Scheduled and manual logging start/stop
- Relay alarms with ICP DAS M-7061 (not included)
- Analogue outputs with ICP DAS M-7024 (not included)
- Temperature chart displays data from 2 channels simultaneously
- CE marked and RoHS compliant

### GENERAL SPECIFICATIONS

#### Display

2.83" (72 mm) resistive touch TFT, 320 x 240 pixels, backlit

#### Supply Voltage

10 to 30 V DC

#### Maximum Current Draw

100 mA

#### Ambient Temperature Range

0°C to 60°C

#### Relative Humidity

Maximum 95%, non-condensing

#### Configurable Parameters (global)

Temperature units, date and time, data logging, graph channels, alarm logging

#### Configurable Parameters (per channel)

Signal processing, emissivity setting, reflected energy compensation, alarms, Modbus address

#### Alarm Configuration

12 alarms (2 per sensor) with adjustable level, individually configurable as HI or LO.

#### Temperature Units

°C or °F selectable

#### Temperature Resolution

0.1°

#### Signal Processing

Average, peak hold, valley hold, minimum, maximum

#### Display Sample Period

120 ms per sensor (720 ms in total for 6 sensors)

#### Compatible Sensor Types

PyroBus (all models), PyroMini (-BB and -BRT models)

### DATA LOGGING

#### Logging Interval

1 to 86,400 seconds (1 day)

#### MicroSD Card

Max. capacity: 32 GB (not included)

#### Internal Clock Battery

1 x BR 1225 3V (not included)

#### Variables Logged

Target temperature, sensing head temperature, alarm events

#### File Format

.csv (can be imported to Excel)

#### Configurable Parameters

Sample period, number of samples, scheduled start date and time

### MECHANICAL SPECIFICATIONS

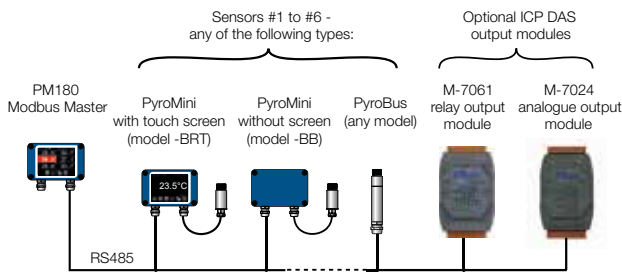
#### Dimensions

98(w) x 64(h) x 36(d) mm excluding cable glands

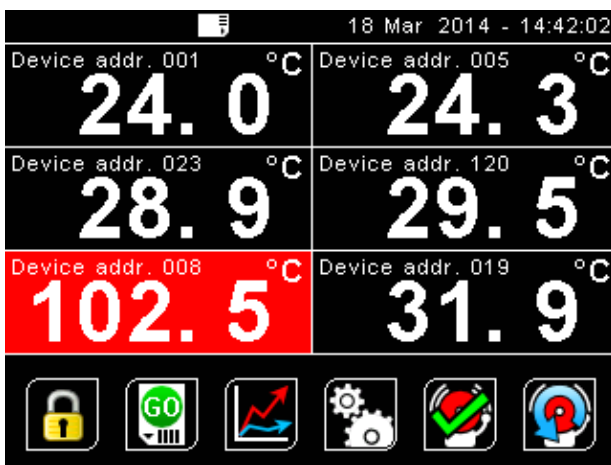
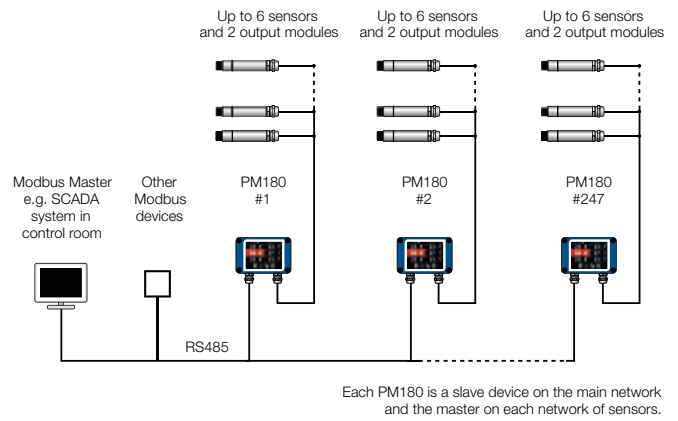
#### Weight

280 g

## PM180 AS MODBUS MASTER

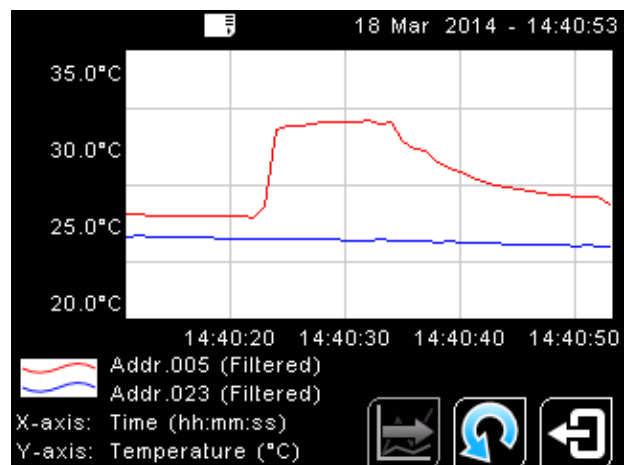


## PM180 AS MODBUS SLAVE



### Intuitive touch screen interface

Display, chart and configure all 6 channels individually or simultaneously. The display for each channel turns red in an alarm condition



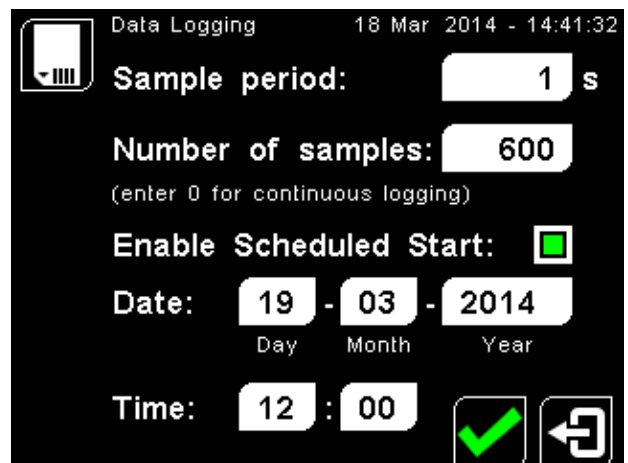
### Temperature chart

Display temperature data from two channels in a scrolling graph



### Password-protected settings

Configure options for each sensor and the PM180 itself via the touch screen interface



### Data logging

Temperature data and alarm events may be logged to a MicroSD Card (not supplied)

## MODEL NUMBERS

### PM180

6-channel Modbus display/logger

## ACCESSORIES

AC adapter **PM180MA**

2 GB MicroSD Card **MSD**

12-channel relay output module **M-7061**

4-channel voltage or current analogue output module **M-7024**

# PyroPen

## Handheld Infrared Thermometer



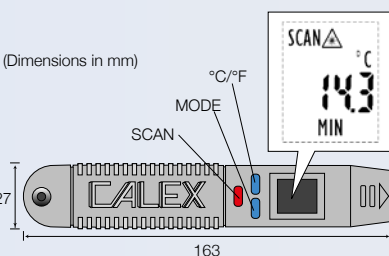
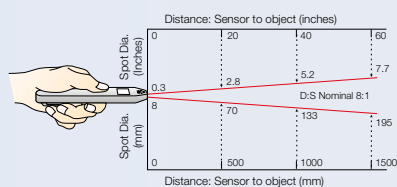
- Conveniently clips into your pocket just like a pen
- Unique ultra compact design
- Wide temperature range
- High accuracy and repeatability
- Fast response
- Displays maximum, minimum, average and current temperatures
- Narrow field of view
- Optional laser sighting
- Optional USB data logging & data acquisition

### GENERAL SPECIFICATIONS

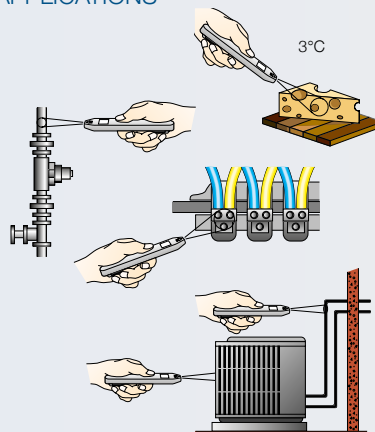
<b>Temperature Range</b>	-20°C to +500°C
<b>Accuracy</b>	+/-1% of reading or +/-1°C whichever is greater
<b>Repeatability</b>	+/-0.5% of reading or +/-0.5°C whichever is greater
<b>Response Time, <math>t_{90}</math></b>	500 ms (90% response)
<b>Spectral Range</b>	8 to 14 $\mu$ m
<b>Ambient Temp Range</b>	0°C to +50°C
<b>Housing</b>	Pen style
<b>Display</b>	3.5 digit LCD
<b>Power</b>	2 x AAA batteries
<b>Reading</b>	°C or °F SCAN/HOLD/LOCK/MAX/MIN/AVG
<b>Display Resolution</b>	0.1°
<b>Field-of-view</b>	8:1
<b>Relative Humidity</b>	10 to 95% non-condensing
<b>Dimensions</b>	163 mm x 27 mm x 16 mm

	PyroPen E	PyroPen L	PyroPen U
<b>Emissivity</b>	Fixed at 0.95	Adjustable 0.3 to 1.0	Adjustable 0.3 to 1.0
<b>Sighting</b>	None	Laser	Laser
<b>Data Logging</b>	None	None	100 memory locations
<b>Data Acquisition</b>	None	None	Via USB cable and CalexSoft software supplied
<b>Weight</b>	50g	60g	60g

### TARGET SIGHTING AND SPOT SIZES



### APPLICATIONS



**Designed to be simple, safe and convenient to use.** The ultra compact PyroPen has been specifically designed to fit into your pocket, just like a pen, so that you can carry it with you anywhere you go.

You simply aim, press the SCAN button and read the temperature immediately. No fuss. No need to focus and no special training.

The non-contact nature of the measurement means that you can take the temperature of moving, rotating, inaccessible or hazardous objects. This makes the PyroPen particularly useful for test, inspection and maintenance applications in industries such as food & beverage, automotive, plastics & rubber, textiles, paper & packaging, chemicals & pharmaceuticals, HVAC, electrical, asphaltting, plus many others.

The PyroPen L has all the features of the PyroPen E, plus laser sighting for small or distant targets and adjustable emissivity.

The PyroPen U has all the features of the PyroPen L, plus a built-in memory for logging up to 100 temperatures and the ability to perform PC based data acquisition via USB. It is supplied complete with USB interface cable and CalexSoft software disk.

**High performance, low cost.** The Calex design team have taken advantage of the latest technology, not only to provide an ultra slim design but to incorporate reliability with high accuracy.

Advanced manufacturing techniques are used to ensure that the PyroPen meets the highest quality standards at low cost.

Each PyroPen comes with additional functions such as maximum, minimum and average temperature measurements. The PyroPen can be LOCKED into the ON position if continuous measurements are required. The last measured value can also be held for those situations where it is not easy to see the display whilst measuring.

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